1 276 100

PATENT SPECIFICATION

(11) 1 276 100

DRAWINGS ATTACHED

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(72) Inventors JACK PALFREYMAN
and HENRY EDWARD MIDDLETON

(54) BLADED MEMBER FOR A FLUID FLOW MACHINE

SPECIFICATION NO 1276100

By a direction given under Section 17(1) of the Patents Act 1949 this application proceeded in the name of THE SECRETARY OF STATE FOR DEFENCE, London.

THE PATENT OFFICE

R 9646/1

According to the present invention, there is provided a bladed member for a fluid flow machine comprising a plurality of angulary spaced apart aerofoil-shaped blades whose root portions are each provided with a first substantially cylindrical part and a second part projecting substantially radially inwardly from said first part, and wherein said first part is mounted in a correspondingly shaped recess in a common blade support member such that the major axis of said first part is substantially parallel to the direction of fluid flow therepast, the blade being allowed to pivot relative to the blade support member in directions substantially transverse of the direction of fluid flow therepast, resilient means being provided to act between said second part and corresponding parts of adjacent blades for resiliently urging said blades towards predetermined relative angular positions.

As will be appreciated, if one of the blades is struck by a foreign object, such, for example, as a bird, the said resilient means will allow the respective blade to pivot with respect to the adjacent blades, whereby to diminish the damage done by the said foreign body.

The resilient means acting between the second parts of the root portions adjacent blades may be at least one assembly of elastomeric balls. Alternatively, said resilient means may be at least one inflatable member.

Each blade aerofoil may have a root portion one part of which is dovetailed and fits into the said substantially cylindrical part.

[*Price 25p*]

The invention also comprises a gas turbine engine compressor provided with a bladed member as set forth above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:—

Figure 1 is a diagrammatic view, partly in section, of a gas turbine engine provided with a bladed member according to the present invention, and

Figure 2 is a diagrammatic perspective view of part of the structure of the engine of Figure 1.

In Figure 1 there is shown a gas turbine jet engine 10 which is adapted for aircraft propulsion and which comprises an engine casing 11 within which there are mounted, in flow series, one or more compressors 12, combustion equipment 13 and one or more turbines 14, the turbine exhaust gases being directed to atmosphere through an exhaust duct 15.

The compressor 12 has, as best seen in Figure 2, a rotor member 16, a part of which is constituted by an annular blade support member 17.

The blade support member 17 is provided with a plurality of angularly spaced apart substantially cylindrical recesses 20. In each of the recesses 20 there is rotatably mounted a substantially cylindrical part 21 of a root portion 22 of an aerofoil-shaped blade 23. Thus, the plurality of angularly spaced apart aerofoil-shaped blades 23 which are carried by the blade support member 17 are pivotally mounted therein.

SPECIFICATION AMENDED - SEE ATTACHED SL

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and HENRY EDWARD MIDDLETON

(54) BLADED MEMBER FOR A FLUID FLOW MACHINE

(71) We, ROLLS-ROYCE LIMITED, a British Company, of Moor Lane, Derby, Derbyshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns a bladed member, e.g. a bladed motor member, for a fluid flow machine such, for example, as a gas turbine engine compressor.

According to the present invention, there is provided a bladed member for a fluid flow machine comprising a plurality of angulary spaced apart aerofoil-shaped blades whose root portions are each provided with a first substantially cylindrical part and a second part projecting substantially radially inwardly from said first part, and wherein said first part is mounted in a correspondingly shaped recess in a common blade support member such that the major axis of said first part is substantially parallel to the direction of fluid flow therepast, the blade being allowed to pivot relative to the blade support member in directions substantially transverse of the direction of fluid flow therepast, resilient means being provided to act between said second part and corresponding parts of adjacent blades for resiliently urging said blades towards predetermined relative angular positions.

As will be appreciated, if one of the blades is struck by a foreign object, such, for example, as a bird, the said resilient means will allow the respective blade to pivot with respect to the adjacent blades, whereby to diminish the damage done by the said foreign body.

The resilient means acting between the second parts of the root portions adjacent blades may be at least one assembly of elastomeric balls. Alternatively, said resilient means may be at least one inflatable member.

Each blade aerofoil may have a root portion one part of which is dovetailed and fits into the said substantially cylindrical part.

[*Price 25p*]

Adjacent blades may respectively have telescopically arranged inner and outer clapper parts. Means, moreover, may be provided for supplying a pressurised fluid to a space within the telescopically arranged inner and outer clapper parts so as to urge the latter apart.

The blade support member may constitute a part of a rotor member, although it is possible, if desired, for the bladed member to form part of a stator member.

The invention also comprises a gas turbine engine compressor provided with a bladed member as set forth above.

The invention is illustrated, merely by way of example, in the accompanying drawings, in which:—

Figure 1 is a diagrammatic view, partly in section, of a gas turbine engine provided with a bladed member according to the present invention, and

Figure 2 is a diagrammatic perspective view of part of the structure of the engine of Figure 1.

In Figure 1 there is shown a gas turbine jet engine 10 which is adapted for aircraft propulsion and which comprises an engine casing 11 within which there are mounted, in flow series, one or more compressors 12, combustion equipment 13 and one or more turbines 14, the turbine exhaust gases being directed to atmosphere through an exhaust duct 15.

The compressor 12 has, as best seen in Figure 2, a rotor member 16, a part of which is constituted by an annular blade support member 17.

The blade support member 17 is provided with a plurality of angularly spaced apart substantially cylindrical recesses 20. In each of the recesses 20 there is rotatably mounted a substantially cylindrical part 21 of a root portion 22 of an aerofoil-shaped blade 23. Thus, the plurality of angularly spaced apart aerofoil-shaped blades 23 which are carried by the blade support member 17 are pivotally mounted therein.

Each of the root portions 22 has a part 24 which extends radially inwardly of the substantially cylindrical part 21. Between each adjacent pair of parts 24 there is arranged either an assembly of elastomeric balls 25 or an inflatable member 26. The assemblies 25, or the inflatable members 26, constitute resilient means which act between the parts 24 and serve to urge the blades 23 towards predetermined relative angular positions.

Adjacent blades 23 respectively have telescopically arranged inner and outer clapper parts 30, 31 which serve to prevent relative axial movement between the adjacent blades. If desired means (not shown) may be provided for supplying a pressure fluid to a space within the clapper parts 30, 31 so as to urge the latter apart.

As will be appreciated, if a bird, or any other foreign body, should strike one of the blades 23 the construction is such as to allow the struck blade to pivot with respect to its adjacent blades whereby to limit the damage caused by the impact.

As shown in Figure 2, the main part of each blade 23 is integral with the substantially cylindrical part 21. However, if desired, each blade may have a root portion one part of which is dovetailed and fits into a correspondingy shaped recess in said substantially cylindrical part.

Although the construction described above has been described with reference to its use on a rotor, it may also, if desired, be used on a stator.

WHAT WE CLAIM IS:—

1. A bladed member for a fluid flow machine comprising a plurality of angularly spaced apart aerofoil-shaped blades whose root portions are each provided with a first substantially cylindrical part and a second part projecting substantially radially inwardly from said first part, and wherein said first part is mounted in a correspondingly shaped recess in a common blade support member such that the major axis of said first part is substantially parallel to the direction of fluid flow therepast, the blade being allowed to pivot relative to the blade support member in directions substantially transverse of the direction of fluid flow therepast, resilient means being provided to act between said second part and corresponding parts of adjacent blades for resiliently urging said blades towards predetermined relative angular positions.

2. A bladed member as claimed in claim 1 in which the resilient means acting between the second parts of the root portions of adjacent blades is at least one assembly of elastomeric balls.

3. A bladed member as claimed in claim 1 in which the resilient means acting between the second parts of the root portions of adjacent blades is at least one inflatable member.

4. A bladed member as claimed in any preceding claim in which each blade aerofoil has a root portion one part of which is dovetailed and fits into the said substantially cylindrical part.

5. A bladed member as claimed in any preceding claim in which adjacent blades respectively have telescopically arranged inner and outer clapper parts.

6. A bladed member as claimed in claim 5 in which means are provided for supplying a pressure fluid to a space within the telescopically arranged inner and outer clapper parts so as to urge the latter apart.

7. A bladed member as claimed in any preceding claim in which the blade support member constitutes part of a rotor member.

8. A bladed member for a fluid flow machine substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

9. A gas turbine engine compressor provided with a bladed member as claimed in any preceding claim.

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1276100 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1.

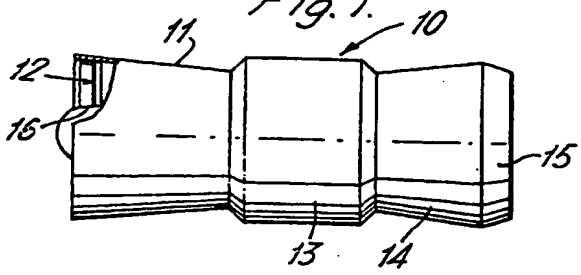

Fig. 2.